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rewards the painful sufferings and losses of the party. Lieut. P. H. Ray, U.S.A., has also rectified many details of the map about Point Barrow, and discovered a range of hills, which he has named the Meade Mountains, running east from Cape Lisburne, from which at least two streams, unmarked, flow into the Polar Sea. We may expect similar service from the Italian parties at Patagonia, and from the Germans in South Georgia. Since the voyage of the Challenger, no marine researches have been more fruitful of results than those of the Talisman and the Dacia. The first was employed last year by the French government, to examine the Atlantic coasts from Rochefort to Senegal, and to investigate the hydrography and natural history of the Cape Verde, Canary, and Azores archipelagoes. The other ship, with her companion the International, was a private adventure, with the commercial purpose of ascertaining the best line for a submarine telegraph from Spain to the Canaries. These last two made some five hundred and fifty soundings, and discovered three shoals, one of them with less than fifty fathoms of water over it, between the continent of Africa and the islands. If we draw a circle passing through Cape Mogador, Teneriffe, and Funchal, its centre will mark very nearly this submarine elevation: the other two lie to the north of it. The Talisman found in mid-ocean but sixteen hundred and forty fathoms, among soundings previously set down as over two thousand fathoms.

Gen. Lefroy then spoke of the extension of railways in Mexico, South America, Africa, and Asia, and of the agreement to refer local time on this continent to a succession of first meridians, one hour apart. The next step will not be long delayed: that is, the agreement of the civilized world to use one first meridian; Paris, Ferrol, Washington, Rio de Janeiro, gracefully, as we venture to hope, giving that precedence to Greenwich, which is demanded by the fact that an overwhelming proportion of the existing nautical charts of all nations, and of maps and atlases in most of them, already refer their longitudes to that meridian. No other change would be so easy, or so little felt.

THE GENERAL STATISTICS OF THE BRITISH EMPIRE.¹

WE will group our statistics under the following headings: 1°. The area consisting of widely extended regions; 2°. The inhabitants of these many lands; 3°. The works of man as they are displayed in this vast theatre of action.

First, then, the area of the British Empire may be set down at more than eight and a half millions of square miles. Out of this total, there are only a hundred and twenty thousand square miles in the United Kingdom. There are a million and a half of square

miles in India; and the remainder, or seven millions, belong to the colonies and to the scattered possessions.

But there are other regions which have fallen, or are falling, under its political control more or less, such as Egypt, including a part of the Egyptian Sudan, some districts in southern Arabia, a part of Borneo, Zululand, the Transvaal, Afghanistan, and Beluchistan. Thus the total area, directly or indirectly, under the authority of the British empire, may be taken at nearly ten millions of square miles, or about one-fifth of the fifty millions of square miles composing the habitable globe.

As might be expected in an empire whereof the real basis of power is maritime, the coast-line is of an extraordinary length, to be measured by about 28,500 miles, with forty-eight large harbors. For the whole of this length, marine surveys have been prepared. But greatness does not depend on area alone, and there is a vast range in the scale of value for lands. Out of the ten millions of square miles, hardly one-fifth is cultivated or occupied, in the widest use of the term 'occupation.' In India, which is popularly, though not quite correctly, supposed to be thickly populated, the cultivable waste is not less than a quarter of a million of square miles.

In the second place, respecting the inhabitants, the total population amounts to 305,000,000 of souls in those regions which are included directly in the empire. This mass of humanity is composed of many diverse nationalities, a cardinal distinction between which is that of religion. Christianity, the religion of the dominant race, is professed by one-seventh of the whole. The religion which includes the largest number is Hinduism. There are 188,000,000 of Hindus; and it may, indeed, be said that the whole Hindu race is subject to the British crown. The Hindus, then, form more than a half of the total population in the empire. The number of Buddhists is not considerable, amounting to about 7,000,000. The imperial area is, on the whole, but sparsely populated, with an average of only thirty-three persons to the square mile, notwithstanding the mighty aggregate of the people, as the population is most unequally distributed.

The third and last heading relates to the works of man, his riches and power, his industrial and commercial operations.

One, among the primary tests of national resources, is the public revenue. The total of yearly revenue and receipts, governmental and local, amounting to £264,000,000 sterling, is unequalled, but falls at the moderate rate of one and a quarter pounds sterling per head of the total of British subjects. There is a large revenue received throughout the empire for local purposes. This income (including various receipts, but excluding loans) amounts to hardly less than £61,000,000 sterling yearly; and the greater part is levied by direct taxation.

Another test of power relates to the provision for external defence and internal protection. Now the men trained to arms in the British empire may be stated at 850,000, including the regular British forces

¹ Abstract of an address to the economic science and statistics section of the British association at Montreal, Aug. 28, 1884, by Sir RICHARD TEMPLE, Bart., G.C.S.I., C.I.E., D.C.L., LL.D., F.R.G.S., president of the section.

at home and abroad, the militia, and volunteers in the United Kingdom, and in the colonies, the British native forces in India, and other countries. This includes 10,000 Egyptian troops under a British general, but excludes the forces of the native states of India, and of the other countries politically connected with the empire. If, however, the forces of the native states of India were to be added (and they are generally available for imperial purposes), then the total of 850,000 would be raised to nearly 1,000,000. Thus the men under arms, or effectively trained to arms, are in number more than 750,000, and, under the last-named computation, would amount to nearly 1,000,000. The defensive armaments of the empire, by sea and land, cost £41,000,000 sterling annually, or twenty per cent of the total of revenue and receipts. The police for the empire numbers 560,000. Thus we have, for the whole empire, an average of one policeman to every 571 of the people, and to every sixteen square miles.

It is never to be forgotten, that one of the main reasons why the British empire is able to keep its land-forces at a comparatively low scale is its preponderance at sea. The predominance which we hope to find in the British navy will hardly be shown by the enumeration of ships. With this caution, however, it may be stated that there are 246 British war-vessels afloat, or in commission; of which 72 are sailing-ships, and 174 have steam-power. There are now 63 iron-clads, either complete or nearly complete. The number of officers and men amounts to 57,000. The number of iron-clads ready for action at the shortest notice is now 44, of which 25 are at sea.

The mercantile marine has nearly half of the steam tonnage, of the carrying power of the port of entries, and of the freight earnings of all the nations together, and two-thirds of the ship-building. The total trade of the British empire cannot be easily exhibited statistically. However, if the aliquot parts of the trade of the principal nations be computed, then 34 per cent, or one-third of the world's commerce, pertains to the British empire.

The manufactures of the United Kingdom are valued at £818,000,000 sterling annually. In general terms, it may be stated, that British manufactures form one-third of those for all Europe put together. The great competitor is of course the United States, where the value appears to exceed that of the United Kingdom. The American manufactures are indeed wonderful, not only in their present magnitude, but in the rapidity of their progress, and in the prospect of their extension.

It follows from these facts, that the wealth of the United Kingdom in land, cattle, railways and public works, houses and furniture, merchandise, bullion, shipping, and sundries, valued at £8,720,000,000 sterling, exceeds that of any European state, and is just double that of Russia. But it is exceeded by the corresponding figure for the United States, namely, £9,495,000,000 sterling. The £8,720,000,000 of British wealth represent a sum seven times the annual income, namely, £1,247,000,000, which seems to be a

fair calculation. According to this, the British people earn 14 per cent on their capital, which rate is about the same as that of the United States. It exceeds the corresponding ratio on the continent of Europe. But it is considerably surpassed by the ratios in Canada and Australia, — 18 and 22 per cent respectively.

The construction of public works is a test of national progress. Those works which may here be selected for mention are railways, electric telegraphs, and canals. It is calculated that 46 per cent of the railway traffic of the world is done by the railways of the British Empire: the distances run, however, are less than on the continent of Europe or in the United States. The electric telegraph does six times as much in the old country as in the new.

The total public debt, governmental and municipal, for the British Empire, reaches a total of £1,312,000,000 sterling.

He concluded this statistical summary by adverting to a group of subjects into which moral considerations largely enter; namely, thrift and education.

The decrease of crime and pauperism is satisfactory in the United Kingdom; while pauperism hardly exists in the other dominions of the empire, and the charitable funds raised in the United Kingdom are enormous. The number of patients in the hospitals, though large, is not remarkable relatively to the size of the empire.

Respecting education, there are 5,250,000 pupils at schools in the United Kingdom, 860,000 in Canada, 611,000 in Australia, and 2,200,000 in India, making up a total of 8,921,000 pupils in the British Empire. The fact is, that in India, although education has made a remarkable progress within the last generation, yet the lee-way to be made up was enormous, owing to the neglect of many centuries; and many children of a school-going age still remain out of school. But the comparison attains special interest when made with the United States, where a truly noble progress is exhibited, and where the number of pupils reaches to 10,000,000, the annual expenditure being £17,000,000 sterling. Thus the extraordinary fact remains, that in respect of educational statistics the United States are numerically in advance of even the British Empire.

The religious missions to non-Christian nationalities constitute a bright feature in the British Empire. The statistics of the Roman Catholic missions are not fully known, but their operations are very considerable. The income of the various Protestant missionary societies is hardly less than £750,000 sterling annually, and the number of European ordained missionaries maintained by them is about 900.

ON THE RELATION OF MECHANICAL SCIENCE TO OTHER SCIENCES.¹

THERE are those who object that section G deals too little with pure science, too much with its applica-

¹ Abstract of an address to the mechanical science section of the British association at Montreal, Aug. 28, 1884, by Sir F. J. BRAMWELL, F.R.S., V.P.Inst.C.E., president of the section.